

USGS-DoD Science Collaborator

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USGS and Dover Air Force Base Investigate Natural Attenuation At Three Landfills and One Fire Training Site



The U.S. Geological Survey (USGS) and Dover Air Force Base collected 319 ground-water and 4 surface-water samples from November 2000 to February 2001 for the analysis of chlorinated solvents and fuel hydrocarbons. Results of these analyses were used to determine the distribution and mass loss of volatile organic compounds from four waste disposal and training sites on the installation.

Contaminant plumes were 500 to 2,200 feet in length. Vertical water-quality profiles indicate that volatile organic compounds are present mainly in the upper part of the surficial aquifer. Two of four sites showed indications that the contaminant plumes are reaching ground-water discharge areas. However, the compound detected was below applicable Delaware Department of Natural Resources and Environmental Control surface-water-quality standards for human health.

An assessment of chlorinated-solvent mass loss in the plume migrating from two of the landfill sites indicates that tetrachloroethene and trichloroethene mass loss downgradient of the source is

negligible, but *cis*-1,2-dichloroethene appears to biodegrade in the plume. Results from one landfill site indicate that the lateral edge of the tetrachloroethene, trichloroethene, and *cis*-1,2-dichloroethene plume may migrate off installation property about 1,500 feet downgradient from the source area. Ground-water flow directions, however, will limit the extent and concentration of contaminants leaving the installation property.

The ground- and surface-water samples collected in this study led to an improved understanding of the areal and vertical extent of the volatile organic compound plumes, the occurrence and fate of volatile organic compounds in the ground-water discharge areas, and the amount of intrinsic biodegradation downgradient of the waste disposal landfills. [Water-Resources Investigations Report 02-4121, Distribution and Mass Loss of Volatile Organic Compounds in the Surficial Aquifer at Sites FT03, LF13, and WP14/LF15, Dover Air Force Base, Delaware, November 2000–February 2001](#), describes the methods, results, and conclusions of this investigation. For further information on this and other investigations at Dover Air Force Base, contact either Jeffrey R. Barbaro (jrbarbar@usgs.gov) or William Guertal (wguertal@usgs.gov).

USGS Models Flow of the Alluvial Aquifer near Ft. Leavenworth

The U.S. Geological Survey, U.S. Army Corps of Engineers, and Ft.

Leavenworth collaborated on a study to characterize and simulate ground-water flow in the Missouri River alluvial aquifer near Ft. Leavenworth, Kansas. The Missouri River alluvial aquifer supplies all of the drinking water for Ft. Leavenworth, the city of Leavenworth, Kansas, and the city of Weston, Missouri. Considering the importance of the aquifer to the region, the Directorate of Installation Support, Environmental Division has recognized that an understanding of the aquifer's flow dynamics and pathways for contamination is important for making decisions related to installation management.

The USGS used hydrogeologic data from 173 locations in the study area to construct a ground-water flow model (MODFLOW-2000), and particle-tracking program (MODPATH), to determine the direction and travel time of ground-water and contributing recharge areas for the aquifer's well field. The model was calibrated to both quasi-steady state and transient hydraulic head using data collected during the study. Ground-water flow was simulated for five well-pumping and river-stage scenarios to determine effects on aquifer draw-down and contaminant migration.

Results of this study will be published in a USGS Scientific Investigations Report later this summer. For further information concerning this USGS investigation, contact the USGS principal investigator Brian Kelly

(bkelly@usgs.gov), or Richard N. Wilms (wilmsr@leavenworth.army.mil), Ft. Leavenworth, Kansas.

USGS-DoD Environmental Program Conference a Success!

The 2004 USGS-DoD Environmental Program Conference has come and gone, but the excellent presentations given at the conference can be viewed at

<http://dodesp.er.usgs.gov/>. The USGS already is planning the next conference. If your agency would like to collocate your major DoD related meeting with the USGS annual conference, please contact either Emitt Witt (ecwitt@usgs.gov) or Jeff de Roche (jderoche@usgs.gov).

USGS and U.S. Army Corps of Engineers Sign MOA

On March 22, 2004, Charles G. Groat, Director, USGS and George S. Dunlop, Principal Deputy Assistant Secretary of the Army, signed a two-way Memorandum of Agreement (MOA) between the USGS and the U.S. Army Corps of Engineers for the purpose of establishing a framework governing the respective responsibilities for the provision of goods and services. The agreement describes the services that each party may provide pursuant to the Economy in Government Act. An electronic copy of this MOA may be reviewed at

<http://dodesp.er.usgs.gov/mou-moa/USGSMOAfnl22Mar04.pdf>.

USGS Participates in ASC/ENV GEOBASE 101 Symposium

The U.S. Air Force Aeronautical Systems Center (ASC), Environmental Directorate (ENV) hosted a GEOBASE symposium at Wright Patterson Air Force Base on 14 April 2004. Topics included an overview of the GEOBASE program, the environmental GIS efforts of the Air Force Center for Environmental Excellence, and the status of GEOBASE at Edwards Air Force Base. USGS provided an update on its GEOBASE activities with ASC and demonstrated the Strategic On-Line Defense Geography Repository (SOLDGR)--DoD's secure link to the USGS *The National Map*. For more information on this and future ASC/ENV GEOBASE venues, please contact Alex Brisken (alex.brisken@wpafb.af.mil) .

USGS and ERDC meet to Discuss Web-based Data Connectivity

At a meeting held in conjunction with the USGS-DoD Environmental Program Conference, representatives of the U.S. Army Corps of Engineers (USACE) Research and Development Center (ERDC) met with USGS representatives to discuss web-based data connectivity to USGS data and the formalization of data sharing agreements between USGS and USACE. USGS described current efforts related to scientific modeling, analysis, and monitoring activities, connectivity to *The National Map*, and data integration efforts. USACE described Science and Engineering (S&E) modeling efforts and data requirements, as well as a new strategy for corporate management of all the

technologies that support S&E applications. One of the primary aspects of the strategy is technology integration, an approach to manage software guidance/capabilities and resources for application developers in a consistent, corporate context, called the Common Delivery Framework (CDF). Based on a service-oriented architecture that uses web services as the building blocks for developing applications, this framework provides a web accessible library of software resources and technical guidance that comprise the “raw materials” that USACE developers, contractors, and partners use to develop specific science and engineering applications. Since USGS data (National Elevation Data, National Land Cover Data, Historic and Real-time Stream Flow, etc.) are common sources of data for USACE S&E modeling efforts, a streamlined, formalized approach to accessing USGS data via web services is a primary objective of CDF. This meeting provided a sound basis for future collaborative efforts between USACE and USGS. For information about future meetings of this group, please contact either Denise Martin (denise.b.martin@erdc.usace.army.mil) or Emitt Witt (ecwitt@usgs.gov).

USGS and U.S. Air Force Research Cost-Avoiding Remediation

The USGS and the US Air Force Aeronautical Systems Center/Environmental Safety and Health Division Engineering Directorate conducted a field-scale demonstration project to evaluate the capacity of the eastern cottonwood tree (*Populus deltoids*) to attenuate trichloroethene

(TCE) contamination of ground water. Biodegradation of chlorinated solvents such as TCE is an electron –donor-limited-process, and several approaches have been shown to enhance in situ bioremediation of chlorinated solvents in aerobic aquifers by delivering an abundance of carbon that serve as electron donors. Existing methods for delivering electron donors to TCE contaminated environments have not been economical. These methods typically included injection, drilling, trenching, and use of recirculation wells.

During the collaborative study, the team found that by the middle of the sixth growing season, trees planted where depth to water was less than 3 meters delivered enough dissolved organic carbon to the underlying aquifer to lower dissolved oxygen concentrations, to create iron-reducing conditions along the plume centerline and sulfate-reducing conditions in localized areas.

Dechlorination of TCE was apparent along the centerline of the contaminant plume beneath the phytoremediation system with increases in degradation from 0.0002/day to 0.02/day during the first 6 growing seasons. The corresponding increase in natural attenuation capacity of the aquifer along the plume centerline, from 0.0004/m to 0.024/m, is associated with a potential decrease in plume-stabilization distance from 9,680 to 160 m. Demonstration results provide insight into the amount of vegetation and time that may be needed to achieve cleanup objectives at the field scale. Results of this research have been accepted for future publication in the Journal of Ground Water. For more information on this research, contact either Sandra M. Eberts (smeberts@usgs.gov), principal USGS

investigator, or Gregory Harvey (Gregory.Harvey@wpafb.af.mil), principal U.S. Air Force investigator.

U.S. Army, USEPA, and USGS meet at Range and Restoration Summit

On 8 June 2004, the U.S. Army Corps of Engineers, the U.S. Environmental Protection Agency (USEPA), and the USGS met for a one-day conference in Kansas City on Range and Restoration issues. The program included presentations on the Army sustainable range program, the Army range inventory, management of cleanup within the Army, military munitions response program, formerly used defense sites, evolving range management issues, and the USGS Strategic On-Line Defense Geography Repository. For more information on the outcome of this meeting, please contact Stephen Scanlon (Stephen.c.Scanlon@nwk02.usace.army.mil) .

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